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THE DEPARTMENT OF DEFENSE

PROGRAM OF RESEARCH, DEVELOPMENT, TEST AND EVALUATION, FY 1978.

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OVERVIEW STATEMENT
BY
THE HONORABLE
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~~UNDER SECRETARY OF~~
~~DEFENSE RESEARCH~~
~~AND ENGINEERING~~

TO THE 95th CONGRESS,
FIRST SESSION 1977.

1. DEFENSE RDT&E OVERVIEW

Mr. Chairman and Members of the Committee,

This is my last statement to the Congress as Director of Defense Research and Engineering.

I want to restate a fundamental conviction which I have emphasized over the last several years and which underlies our program of Defense RDT&E:

> I believe that this Nation must maintain a posture of unequivocal technological superiority.

A willingness to settle for technological "equivalence" is not sufficient; it would be a step to eventual disaster. My overriding concern is that we ensure that we have the climate, the direction, and the national commitment always to seize and maintain the technological initiative. This is fundamental to our security, fundamental to our economic well-being, fundamental to our role in the world. It is our strength. We must recognize it as a national imperative for our future survival and prosperity.

Last year, in assessing the technological balance and trends vis-a-vis the Soviet Union, I voiced concern that these trends, if continued, could lead to a precarious position for us by the mid-1980s. I stated that we must reverse them. Congress responded and appropriated the second consecutive real increase in Defense RDT&E, thereby continuing to reverse a decade-long downward trend in investment in our future security. This action was an important step toward assuring a posture of technological superiority into the 21st Century.

This request of $12 billion for FY 1978 Defense RDT&E, which represents a real growth of some 6 percent, will sustain that commitment. It is an important phase of the prudently paced multi-year investment which I discussed with the Congress last year. It will assure the projection of our technological leadership into the future. It constitutes less than 10 percent of the total defense program, as contrasted with more than 14 percent in the early 1960s, and has been scrubbed by more than $1 billion from a fully justifiable and carefully planned program. However, if managed vigorously, I believe that it will still maintain the needed momentum and permit us to achieve this national objective.

TECHNOLOGY BALANCE UPDATE

During the last several years we have studied extensively the scope and quality of military research and development in the Soviet Union and have compared it with our own effort. From this we have derived a feeling for relative trends and relative strengths and weaknesses and how these might impact us in the future.

In my overall assessment last year -- in which I described many numerical indicators and analyses of the quality of the products emerging from Soviet R&D in the strategic, general purpose forces, and space areas -- I concluded:

- that today the US has a technological lead in most areas crucial to our security but that lead is eroding and in some areas is already gone
- and that, without appropriate action on our part, the Soviets could achieve, on balance, a position of clearly perceived military superiority in terms of the combination of quantity and quality of their deployed military weapons at some point during the 1980s.

I suggested that the "appropriate action," which would prevent this sober assessment from becoming a prediction of future reality, should be a strong national commitment to retain our technological leadership backed by a multi-year investment having continuity and real annual growth of at least six to ten percent in R&D and procurement.

This budget request for FY 1978, if fully funded, will take us another positive step in this direction and, in my judgment, will allow us to continue to reverse some of these dangerously developing trends at a time when we can accomplish this most efficiently and at least cost.

Nothing during the last year has changed my basic technology balance assessment. The Soviet Union's determined drive toward supremacy in deployed military technology has not abated. It continues on a broad front. There have also been some surprises: I note, for example, the deployment of the powerful new HIND D attack helicopter; further demonstration of anti-satellite capability; and the profuse armament aboard the Kiev, including long-range, supersonic, tactical cruise missiles.

All of this underscores the fact that the technological competition is very real and is intense. The Soviet leadership stresses explicitly the necessity of acquiring and maintaining the initiative in military-technological developments so as to insure that the qualitative level of Soviet weapons becomes unsurpassed and ultimately "that the USSR triumphs over the US in the crucial struggle for military-technological supremacy." This belies any direct action-reaction mechanisms which may

have existed in the past. It also explains the sheer magnitude of the Soviet effort in basic science and military research and development, which is far larger than our own effort in terms of overall commitment of people and resources.

Soviet production technology is becoming increasingly sophisticated; the Soviet Union is steadily gaining the ability to manage the production of large-scale complex systems. This means that, instead of needing to offset just a quantitative advantage with our own quality, we are increasingly facing "quantity and quality" -- and this, in turn, places a still greater premium on the quality of output from our own technological efforts.

We have a strong advantage in having a large and competitive high-technology civil sector upon which we can draw. We also have an advantage in certain critical technologies such as microelectronics, computers, and materials. We must vigorously exploit these technologies and continue to build on our advantage in the future. The Soviets understand this and are seeking to acquire Western products and production technologies in these areas.

In the strategic area we have generally underestimated the momentum of Soviet programs and their rate of progress in technical performance (e.g., high-accuracy guidance technology). A Soviet countermilitary advantage is clearly coming into existence and, along with it, a war survival posture that could seek to place the USSR in a stronger position than the United States if war occurred.

In general purpose forces the Soviets have undergone and are continuing a massive expansion and technological transformation in all mission areas:

- Although I believe that we maintain decided performance advantages in our tactical air forces, an area in which we must maintain a clear margin of superiority, the Soviets are rapidly acquiring a new generation of offensively oriented aircraft (large range-payload) and deploying them in large quantities.

- In the maritime balance the situation is not as clear although, on balance, we still probably lead. The Soviets are developing formidable attack submarine technology, a variety of offensive strike cruise missiles, global command and control involving use of satellites, and a world-wide land-based naval aviation arm in the Backfire -- all of which lead to the ability to interdict the sea lanes so vital to the Western world.

- It is in the area of land warfare systems that I am most immediately and urgently concerned. The Soviets have mounted a modernization program of unprecedented magnitude. In many cases they are widely deploying technology now for which we will not have roughly comparable counterparts until the early-to mid-1980s. For example:

Mobile air defense	sophisticated, dense
Attack/assault helicopters	very impressive, new aerial platform for advanced weaponry and tactics
Infantry combat vehicles	superb new systems; amphibious, armored, heavily armed
Self-propelled artillery	long range, high firing rate
Tanks	new T-72 in large quantities
Mobile multiple rocket launchers	enormous firepower; we have no comparable weapon
Anti-tank weapons	long stand-off, precision guidance
Electronic warfare	organic part of doctrine
Mine-laying	a Soviet specialty
Chemical warfare	clear Soviet lead
Support vehicles/equipment	extensive, complete
Sophisticated command & control	an area of Soviet concentration

Their new capabilities aggregate to a revolutionary change in land warfare. They are clearly designed for the surprise and rapid movement associated with a massive breakthrough blitzkrieg strategy involving high mobility, unprecedented massed armor and firepower and new kinds of tactics. And always -- along with this striking technological progress -- is the issue of deployment in huge quantity.

Finally, in assessing an overall technology balance we must always be sensitive to the unknown but real possibility of technological surprise. We are competing with a closed society. We lay out in the open and debate our plans, our thinking, our accomplishments; the Soviets do not. And in our highly complex and technologically dependent society, we may be particularly susceptible to numerous possibilities for technological surprise which could have disastrous economic or security consequences.

This overall assessment portrays a magnitude of commitment and momentum on the part of the Soviet Union which inevitably will carry long into the future. I believe the net technology balance is clearly on our side today, but it is deteriorating. The Soviet Union has the expressed determination and has mounted an effort whose inexorable goal is to further erode and erase that lead. If this is a blunt, sober picture, it is not of our making. These trends must be dealt with realistically and prudently -- and now.

This assessment forms the background for our own programs of research and development and modernization investment.

U.S. DEFENSE RDT&E -- STATUS AND PERSPECTIVES

I have strongly and explicitly emphasized the following three objectives in formulating and managing the Defense RDT&E program over the last several years:

1. Maximize the output of R&D in terms of completed system developments which can be produced and fielded to provide the needed near-term modernization of our armed forces.

2. Strengthen the management of systems development and acquisition.

3. Strengthen and broaden the base of technology to insure innovative new options and major new technological directions for our long-range security.

I believe we have made very significant progress in all three areas. The FY 1978 program will build directly on this base.

I will comment briefly on each of these objectives:

1. Output of RDT&E Program

In the end, the measure of a successful research and development program is superior and affordable weapon systems in the hands of the armed forces. We have concentrated on completing existing programs and successfully transitioning them to production even at the expense of postponing some important new developments.

I believe the program has been extraordinarily productive in terms of this objective. 1975 and 1976 have been banner years in reaching critical milestones. Table 1 shows a representative list of major systems which have been introduced into production or are reaching that point. It is an impressive list. It represents part of the "return-on-

investment" in Defense R&D, and I believe that return for the taxpayer is high.

All of this illustrates that, in fact, we are in the midst of a broadly based modernization program which is reaching fruition. The need for this program is evident when we examine the military hardware we have in the field today and look at the vintage of its basic design and its physical age. Examples are shown in Table 2. Although we have continued to upgrade these equipments over many years (such as the M-60 tank, the F-4 fighter, the B-52, helicopters, air defense, etc.), many of them have been operated for 10 to 20 years. They are being replaced by the new capabilities which are the output of the RDT&E process and which must compete with the massively deployed new generation of Soviet equipment described above.

On the whole, we can see that our modernization will not be felt until the early-to mid-1980s. The lead times are long. It is urgent that we press forward to achieve our modernization goals.

Table 3 indicates a large number of important modernization programs also continuing in full-scale development. We are giving their success top priority.

In order to achieve this high output, we have purposefully been very selective in the number of programs allowed to enter the expensive full-scale engineering development phase. This is illustrated in Table 4, which also shows a number of programs delayed and held in the relatively less expensive early or advanced development status.

In summary -- overall we have a large number of important new systems maturing toward production. We have many problems and sometimes fall short. But in general I think the productivity is high as measured against the rigid standards of performance and cost we set for ourselves and which are necessary for a secure posture in the 1980s.

2. Management of Systems Acquisition

I believe our emphasis on more rigorous management is paying off. Last year I reported that the annual cost growth rate for all programs (about 50) in the Selected Acquisition Reports, adjusted for escalation and quantity, dropped from 6.4 percent in December 1972 to 4 percent in 1975. This has since been further improved to 3 percent. These results are often masked by inflation. But the progress is real and steady. We have a long way to go -- but I believe we are learning how to do a better job.

As I stated last year, my goal is to better anticipate and manage the problems inherent in the development of systems operating on the forward edge of technology and, when problems occur, to treat them openly and effectively in a way that inspires confidence from Congress and the public.

We are stressing the following:

- o Competitive Prototyping. Competitive hardware demonstration rather than paper competition has an enormous pay-off which is worth many times the investment in terms of better products and lower cost. We have seen this over and over again (examples: F-16/F-18 lightweight fighters, XM-1 tank, UTTAS, F-16 radar, Cruise Missile Guidance, AAH, AMST).

- o Design-to-Cost. Becoming a way of life and has paid off. 69 major defense systems now at various stages in the DTC program.

- o Better Program Management. The most important of all. The Defense Systems Management College has been expanded. Program management has been established as a career path in the services.

- o Independent Cost Estimating. We are developing this discipline in the Services and it is leading to more realistic prediction of program costs at their inception.

- o Rigorous Management Review. The Defense Systems Acquisition Review Council (DSARC) process has been improved continually and is reflected now in similar reviews in the Services.

- o Mission Area Needs. We are implementing OMB Circular A-109 by emphasizing stronger program concept formulation and justification before a program is initiated. This is critical to better use and management of our defense resources.

- o Emphasis on Life-Cycle Costing. Objective is to reduce escalating operation and maintenance costs. We are beginning to make progress, but still have a long way to go.

- o Better Contracting. Better incentives for performance are being developed. We have initiated a "Four-Step Process" to help eliminate technological levelling, buy-ins and de facto auctioneering of programs which have led to large overruns in the past. We now allow interest on capital investments which will reduce costs.

- o Emphasis on Software Management. Software accounts increasingly for cost and schedule overruns and constitutes a large fraction of the total cost of modern systems. We are attempting to reduce these costs.

- o Manufacturing Technology. We have introduced extensive investments in manufacturing technologies which will increase productivity and reduce costs.

- o System Test and Evaluation. We are emphasizing independent and more realistic operational testing early in the development cycle to discover problems. The result is better products.

At times I feel that progress is slow, but these and other similar management actions are having a significant effect. Furthermore,

I firmly believe that, in research and development, firm and exacting management not only decreases costs but improves the quality of the research and the quality of the resulting products. This emphasis on management in defense R&D and systems acquisition should be expanded and continued in the future.

3. Base of Technology

Our long-range security and our insurance against technological surprise depend directly on the creation of a broad, dynamic, and innovative base of technology on which we can build for the future. A strong research and development program must always provide options for policy decision makers. This is our hedge for the future against surprise -- and increasingly in the future, we will need this flexibility.

I have given special attention to this area because the support for this part of the overall RDT&E program had eroded by almost 50 percent in real terms during the 1960s and early 1970s.

Two years ago, I outlined a general approach or strategy for managing the Defense RDT&E effort. In it, I divided the overall program into two parts:

Group One: Creation and Demonstration of Options
Group Two: Full-Scale System Development

Group One includes the technology base, demonstration of new concepts, competitive prototyping, pursuit of alternative solutions to military problems -- i.e., the creation of a broad base of advanced technology and technological options from which decision makers select only those few programs which should enter the expensive Group Two

category. In Group Two, the concepts are fully developed for production and deployment in the field. A rigorous DSARC review controls this process and the number of programs transitioning from Group One to Group Two has been reduced significantly over the past several years.

Within this framework I have taken the following actions to rebuild the quality of the Group One or technology base part of the RDT&E effort:

- o Funding Policy. Because of the serious erosion in support, I outlined to Congress two years ago a multi-year plan for correcting this situation in which I requested a 10 percent annual real growth rate in Research (category 6.1) and a 5 percent annual real growth in Exploratory Development (category 6.2). Congress has fully supported this plan for two years and I can already feel the uplift and new vigor resulting from this action. I ask for your continued support and promise that it will have a major and long-lasting impact. The total request for the technology base program (categories 6.1 and 6.2) for FY 1978 is $1,880 million.

- o DARPA. I regard the Defense Advanced Research Projects Agency as the "corporate research laboratory" of DOD. We use DARPA to concentrate on a number of specific high-risk but potentially very high-payoff directions which can have a major or revolutionary impact on our capabilities. Examples are high energy lasers in space, revolutionary advances in submarine detection, new forms of digital communications and command and control, ceramic turbines, artificial intelligence, new types of lightweight fighting vehicles. Because of the high probable success of these and similar thrusts and the impact they will have, I am asking for a significant increase in the DARPA budget as part of the Group One, or technology base, revitalization program.

- o DOD In-House Laboratories. To improve the quality of the in-house laboratories, we are moving toward block-funding and increasing the accountable responsibility of their leadership for the quality of the technology base work. At the same time, we are proceeding toward an objective of restoring the ratio of in-house to contract R&D to the lower and better balanced ratios which existed in the early 1960s. We are proceeding

with consolidations, where reasonable, to reduce the overall size of the in-house establishment.

- o Industrial Independent Research and Development (IR&D). IR&D is absolutely central to the quality of defense RDT&E and weapons acquisition and I believe that its "independence" must be maintained. It is the heart of a competitive and competent industrial base: it results in lowering the cost of acquisition and it is a uniquely efficient source for new technology and the innovative new options of Group One. It is well managed, and excellent visibility is provided to the Congress. It pays for itself many times over. I feel that further controls such as separate line item budget approval in advance by Congress would destroy its independent and innovative character and be a serious loss.

- o DOD-University Relations. The traditionally strong and mutually supportive relationship between DOD and the university community has greatly attenuated over the years. Starting with World War II it was the well-spring for the surge in our technical strength in terms of both critical research and people. I believe this relationship must be rebuilt; we are encouraging greater support of university research and participation by young university faculty and students in DOD laboratory activities. This trend is vital; it will be expanded.

SOME TECHNOLOGICAL DIRECTIONS OF GREAT PROMISE

With our prime focus on achieving a secure posture in the 1980s and, therefore, with most of our resources devoted to the maturing programs of today, we must keep in mind the directions which could afford radically new capabilities or, alternatively, could present us with technological surprise. Here are a few:

- o The greatest force effectiveness leverage for the future lies in integrating in real time the functions of surveillance, target acquisition and command and control of forces. Building on concepts such as AWACS, NAVSTAR, packet communications, and battlefield fusion of intelligence, force multiplier factors of three and upwards can be achieved. We must rely on such force multiplier technology to compensate for "quantity and quality" on the Soviet side.

- o Cruise missiles -- already changing military thinking -- are in their infancy and offer revolutionary potential. Future characteristics such as "zero CEP" accuracy at large stand-off ranges and supersonic dash, at relatively low cost, will fundamentally change land, sea, and air warfare.

- o High energy lasers.

- o New forms of undersea submarine detection.

- o New capabilities in space, including satellites used for targeting, missile guidance and surveillance.

- o Applications of the Space Shuttle.

- o Aircraft with low observables to make them virtually undetectable and with V/STOL capabilities.

- o New forms of defense against ballistic missiles.

All of these and others will dominate future thinking and our future programs. A vigorous technology base must be created now.

NATO STANDARDIZATION

There is increasing recognition of the importance of achieving efficiencies and improved effectiveness through standard and interoperable systems in NATO.

I feel the US should take the lead in bringing this about through a policy of international cooperation with our Allies which will encompass joint industrial programs, licensing both ways, and co-production.

We have been pursuing this goal vigorously. We have made a great deal of progress despite the complexities of national interests, international economic factors, and industrial pressure groups here and abroad. But we still have a long way to go. The Culver-Nunn legislation has been very supportive of this effort.

The F-16 is a successful adoption of NATO standardization on a US product. The US adoption of the German/French ROLAND is an example of an excellent system which fills a high priority need for us and achieves a high degree of standardization and interoperability in NATO.

Other recent examples include adoption of common consumable logistic items on the XM-1 tank, adoption of our AIM9-L missile, cooperative programs on air-to-surface ordnance, ship defense missile, secure communications, ammunition, field radios, Harrier V/STOL, and others. NATO AWACS, which would provide a powerful and cohesive capability for the Alliance, may yet become a reality.

I urge Congressional understanding and support for this thrust.

TECHNOLOGY TRANSFER

The subject of technology transfer is controversial. On one hand, our free enterprise system allows and encourages the export of products and technology, and this is of economic importance to the Nation. On the other hand, much of this technology is the lifeblood of our future security, both military and economic. Moreover, the Soviets are clearly seeking to narrow critical areas of deficiency (e.g., microelectronics, materials, computers, instrumentations, production technology, etc.) by importation of Western technology.

The Defense Science Board, at our request, has studied this issue and made recommendations on how to improve our controls. The Board

proposes that we concentrate less on the myriad of individual controls on products per se and concentrate more on control of development, production and process control technologies and on control over the more "revolutionary" technologies which are emerging (versus "evolutionary" technologies).

I am convinced that stronger and more effective treatment of technology transfer is required. We are taking steps to implement the DSB recommendations. New guidelines are badly needed. Changes in the bureaucracy of munitions and export control may be needed. We cannot afford to deplete the reservoir of technology vital to our national interests and leadership faster than that reservoir can be refilled.

JOINT SERVICE PROGRAMS

The time is long past when we can have the luxury (and waste) of individual Service developments for every "requirement". In addition to fiscal realities, the complexities of modern systems and requirements for intimately integrated and interdependent tactics between Services dictate that we increasingly approach requirements and systems developments on a truly joint-Service basis.

I have stressed joint-Service programs with a designated lead Service as a preferred alternative to total centralization of management in DOD. I am encouraged by our progress: we now have some 60 or more joint development programs and another 15 or so Joint Operational Test and Evaluation programs. Progress is sometimes difficult, but the results justify our efforts.

Some outstanding examples are the NAVSTAR Global Positioning System, internal countermeasures for the F-16/F-18 fighters, GATOR mine, and AIMVAL/ACEVAL air combat test. The new Beyond Visual Range air-to-air radar missile is another example, as well as the Cruise Missile Program. Table 5 shows a somewhat more complete list.

Joint programs will be increasingly important in the future. They save money. They provide common and well-integrated military capability among Services.

HIGHLIGHTS OF FY 1978 RDT&E PROGRAM

The requested overall level of $12.0 billion for FY 1978 represents a continuation of the general program and major areas of emphasis described in the previous section. Simply stated, there are many programs either in full scale development or transitioning to production to which we are giving top priority at necessarily great cost. Very few programs will be allowed to enter the expensive full-scale development phase and a number of promising areas are being held back so that we can concentrate on those of the highest priority for the near-term modernization of our forces.

1. Strategic Programs

At the heart of our strategic programs is the need to improve and modernize our forces in the face of asymmetries in favor of the Soviet Union which are incipiently forming both in terms of offensive countermilitary capabilities and damage-limiting defensive capabilities. Our programs must neutralize any such possibilities at the outset, keep

nuclear conflict unthinkable, grant no unfavorable asymmetry, maximize deterrence - and, therefore, stability - in our relationship with the Soviet Union.

We request $2.4 billion for strategic R&D programs, which continues essentially constant funding since FY 1973. I feel this is modest in view of a Soviet momentum in the strategic area which continues at a high level.

With this investment we propose to feature the following:

- o Continue R&D on the B-1 which is transitioning to production.
- o Continue TRIDENT I (C-4 missile) for beginning deployment in 1979. Planning will begin for a longer range TRIDENT II.
- o Minuteman III improvements will continue. M-X will enter into prudently-paced engineering development. It will have a large number of improved-accuracy warheads and will be designed for multiple-aim point survivability. It will maximize the retaliatory capability of a residual force after taking a first strike and will discourage Soviet first strike counterforce ambitions.
- o Cruise missile development will proceed as powerful and inherently stabilizing complementary dimensions to our strategic forces. The air-launched ALCM and variants of Tomahawk for submarine and surface launch will use common guidance, propulsion and warheads. Flight tests on both ALCM and Tomahawk have been outstandingly successful and the guidance more accurate than predicted last year. Cruise missiles, both nuclear and non-nuclear, are the most significant weapon development of the decade. We are consolidating their management under a Joint Air Force/Navy program office.
- o We are exploring new techniques for improving accuracy with submarine launched missiles (FBM Accuracy program), and new concepts in re-entry vehicles and guidance systems (ABRES) and for maintaining the security of our fleet ballistic missile submarines (SSBN Security Program).

- o Ballistic missile defense has been reduced to what I feel is a minimum sized program for hedging against future uncertainties and from which we could respond in a reasonable time of several years if required. The program will explore a broad range of future defensive applications including possibility of revolutionary technologies.

- o In space, the question of satellite survivability is paramount in view of recent Soviet activities and will receive intense attention, along with an expanded effort on space surveillance.

- o Finally, central to our strategic posture is the effectiveness of our command, control, warning and surveillance systems. We are requesting increased support for this area in 1978.

2. Programs for General Purpose Forces

We propose to invest $4.4 billion, or about 36 percent of the FY 1978 RDT&E request, in programs which provide for the modernization of our general purpose forces to keep pace with Soviet expansion and technological transformation discussed above. This emphasis continues the trend of the last several years. It reflects the premium we must place and are placing on deterring non-nuclear conflict and keeping the nuclear threshold as high as possible in a period of dramatic improvements in Soviet capabilities.

The program focuses on deficiencies in two potential areas of confrontation: Central Europe and the sea lines of communication. It has been structured to reverse the adverse trends in land warfare systems, to maintain the maritime balance and to retain our clear margin of superiority in tactical air forces. To do this, we are again giving priority to those programs which will provide urgently needed new capabilities in the hands of our forces in the near term. A few examples of key programs and our objectives follow.

Land Combat

The relentless growth in Soviet Tactical Forces capability and the threat it presents to the non-nuclear defense of NATO have been noted. The land combat weapons acquisition program is aimed specifically at countering these newly developing weapons and the tactics and doctrine which accompany them. R&D in land combat features:

- o Air Defense - We will continue the carefully planned development of a family of air defense weapon systems to counter the Pact's increasing saturation air attack capability. Major programs include the European developed ROLAND all weather missile system (similar to Soviet SA-8 system deployed since the mid-1970s), the PATRIOT (SAM-D) high-to-medium altitude air defense system and the STINGER shoulder-fired missile system, all of which continue in engineering development. The proposed air defense gun program is a new effort leading to an armored gun system for the protection of mobile armored forces.

- o Mobility/Firepower - Efforts in this area have been aimed principally at increasing the firepower available to the ground commanders. The XM-1 will have superior mobility, a new turbine engine, and increased survivability and firepower. The M-198 towed howitzer, now in production, will be supplemented in the future with the General Support Rocket System, a new program. The GSRS will provide a very high rate of fire to help counter the Blitzkrieg or surge tactic. The Advanced Attack Helicopter (AAH) and HELLFIRE missile system have moved into engineering development and when deployed together, will improve our anti-armor capability significantly. The TOW missile is being placed under armor on the MICV and M113 vehicles to reduce the vulnerability of our anti-armor forces to Soviet artillery. The COPPERHEAD cannon launched guided projectile program continues in engineering development and will provide a creditable anti-armor capability utilizing standard field artillery assets. Electronic warfare will continue to be emphasized.

- o Target Location - Delivering firepower effectively is dependent on our ability to locate targets beyond the visual line of sight. Efforts to improve this capability center on the TPQ-36/37 counter mortar and counter battery radar systems, the SOTAS heliborne sensor for locating moving targets, and the REMBASS system for locating

and classifying ground targets. Remotely piloted vehicles continue in advanced development and we have initiated an interim scout helicopter capability in consonance with the fielding of the AAH.

- Tactical Mobility - Programs to enhance battlefield mobility include the UTTAS utility helicopter, now transitioning to production; the MICV infantry combat vehicle, in the final stages of engineering development; and improving the lift capacity of the CH-53E cargo helicopter.

Tactical Air Forces

We will continue a major tactical air forces modernization program to retain essential superiority in the face of an already formidable and growing threat. Key programs include:

- New, affordable, high-performance aircraft/avionics such as the F-15 and A-10 continuing in production; the F-16 nearing production, having achieved all major development objectives and continuing a successful NATO standardization program; and the F-18 carrier-based fighter in engineering development.

- Having modernized the aircraft platforms, we will now emphasize improvement of air-delivered ordnance for these platforms. Imaging Infrared MAVERICK, approved for engineering development, and the GBU-15 modular glide bomb are among several programs which will provide enhanced support for the ground forces in the European combat environment.

- Air-to-air missile developments include improving the AIM-7F with a monopulse radar guidance system, if this proves to be cost effective; the beyond visual range (BVR) program for a next generation air-to-air radar guided missile; and the AIMVAL tests to help define the next generation of infrared missile to replace the AIM-9L.

- The Air Force EF-111A Manned Support Jammer System and the Navy's Tactical Airborne Signal Exploitation System (TASES) are the major systems in a broad and important program of airborne electronic warfare for both offensive and defensive purposes.

- We continue laying the technology groundwork for the next generation of V/STOL aircraft. An improved version of the deployed Marine Corps AV-8 HARRIER is under development. Future applications of V/STOL technology will be important to the Air Force as well.

Naval Forces

Major issues remain (a) anti-submarine warfare; (b) ship defense in the face of an increasing cruise missile threat; and, (c) naval command and control.

- Anti-submarine Warfare - Progress continues toward a significantly improved capability to counter the steadily growing Soviet submarine threat. The LAMPS MK III Helicopter, Surveillance Towed Array Sensor System (SURTASS), SQS-26 Surface Ship Sonar, improvements to the Sound Surveillance System (SOSUS) and the CAPTOR mine are important elements of the overall ASW R&D program.

- Fleet Defense - Needed improvements in the fleet's ability to deal with Soviet anti-ship missiles and naval aircraft depend on the successful development and deployment of a number of shipboard defensive systems. These include the AEGIS system and its Standard Missile II for the high to medium altitude threat; the Shipboard Intermediate Range Combat System (SIRCS) for defense against high speed, low altitude targets, such as Soviet cruise missiles; and improvements to the PHALANX close-in system.

- Fleet offensive capabilities will be enhanced in the near term by the addition of the HARPOON, which is transitioning to production; and, in the longer term, by the longer range TOMAHAWK cruise missile.

- Naval command, control and communications efforts include developing communications satellites to support global operations (FLTSATCOM) and advanced satellites to improve our over-the-horizon targeting capabilities.

CONCLUDING REMARKS

In this Overview, I have tried to present a balanced and realistic picture of trends vis-a-vis the Soviet Union and a broad perspective of our program of Defense RDT&E with these trends as the background. The detailed rationale and description of the proposed FY 1978 program is my full statement.

We now lead in the technology competition, but this qualitative lead is diminishing and the Soviet quantitative advantage remains or grows.

Our program is focused on bringing to maturity a large number of systems now in full-scale development and thereby upgrading our deployed capabilities in the late 1970s and early 1980s. It will be a time of high investment for us -- there is no cheap way to insure our continued national security.

As a result of funding constraints and our emphasis on near-term modernization, we have allowed relatively few new programs to proceed into full-scale development. Should this continue, I am concerned that we will dry up our creation of options for the future which have had major payoffs in recent years. We should be starting many more prototype hardware demonstrations than we have been able to fit into the program in spite of their spectacular payoff. This must be an area of renewed investment in the future. I would also hope that our primary focus on the near term does not create overconservatism and that we

never lose our willingness to take risks for high payoffs. In the end, that is our strength and should always remain our style.

In basic technology we must gain renewed momentum in innovation. We should also not lose sight of the economic benefits which inevitably flow from a vigorous program of defense research and development at the forefront of technology.

A strong program of Defense R&D is a powerful guarantor for our future.

We have such a program. Congress has reversed a deteriorating pattern and, with a continued commitment for FY 1978 to an unequivocal goal of US technological leadership, I believe we can look to the 1980s and beyond with optimism.

# # # #

TABLE 1

Programs in Final Stages of Development or Early Production (FY 1978)

UTTAS Transport Helicopter
HARPOON Anti-Ship Missile
AWACS
AIM-9L SIDEWINDER Air-to-Air Missile
AIM-7F SPARROW Air-to-Air Missile
F-16 Air Combat Fighter
SM-2 Standard Missile
STINGER Air Defense Missile
PHALANX Ship Defense
B-1 Bomber
TRIDENT I Strategic Missile
TRIDENT Submarine
Laser MAVERICK Air-to-Ground Missile
MICV Infantry Combat Vehicle
TACFIRE Artillery Control System
EF-111A EW Aircraft
CH-53E Cargo Helicopter
FLEET SATCOM Communications Satellite
A-6E TRAM
FLIR on A-7E
GBU-15 Glide Bomb
AN/TSQ-73 Air Defense System
XM-198 Howitzer
AN/TPQ-36 and AN/TPQ-37 Mortar and Artillery Locating Radars
JTIDS Secure Data Link Terminals for AWACS
ALQ-131 Jammer
CAPTOR Mine
PHM Hydrofoil
Low-Cost EW Suite for Ships
Artillery Delivered Mines
Advanced WILD WEASEL Aircraft

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TABLE 2 – MODERNIZATION

INITIAL OPERATIONAL CAPABILITY DATES

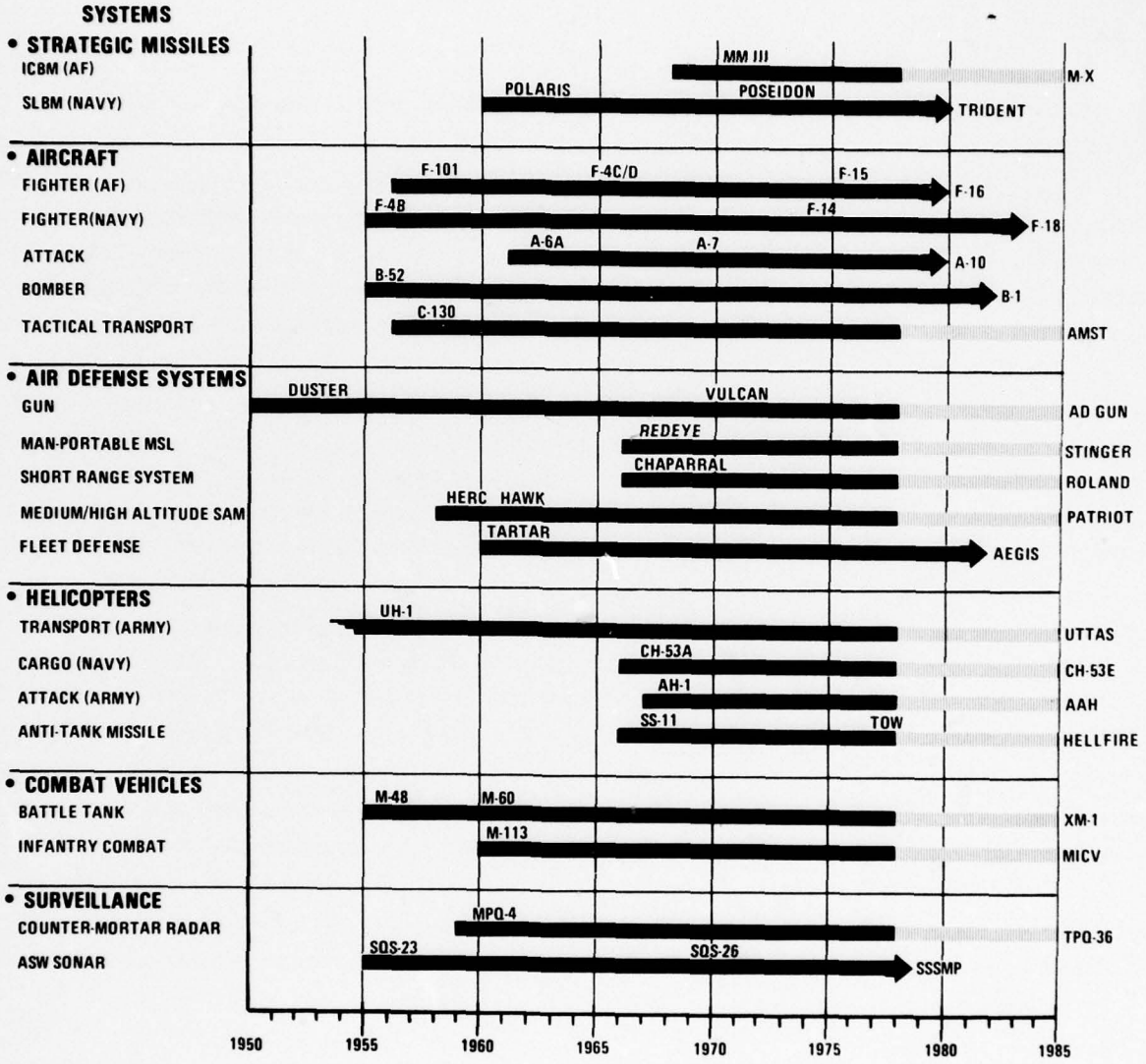

TABLE 3

Programs Continued in Full-Scale Engineering Development (FY 1978)

XM-1 Main Battle Tank
Tomahawk & ALCM - Cruise Missiles
COPPERHEAD CLGP - Precision Artillery Projectile
HELLFIRE - Anti-Tank Missile
AAH - Advanced Attack Helicopter
DSCS III - Communications Satellite
TRI-TAC - Tri-Service Tactical Communications
ROLAND - Mobile Air Defense System
PATRIOT (SAM-D) Air Defense
F-18 - Navy Lightweight Fighter
Imaging Infrared MAVERICK Missile
AEGIS Fleet Air Defense
BUSHMASTER Automatic Cannon
E-4 Advanced Airborne Command Post
TACTAS - Tactical Towed Array Sonar
PLSS - Precision Target Location System
RIM-7 SEA SPARROW
HARM - High Speed Anti-Radiation Missile
LAMPS III - ASW Helicopter
Tank Thermal Night Sight
Vertical Launch - *STANDARD Missile*
COMPASS COPE - Remotely Piloted Vehicle
SURTASS - Surveillance Towed Array Sonar

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TABLE 4

o Programs to Enter Full-Scale Development (FY 1978)

SOTAS - Stand Off Target Acquisition System
AMST - Transport Aircraft
NAVSTAR - Global Positioning Navigation System
Space Shuttle Interim Upper Stage
5-Inch Guided Projectile
ASMD - Anti-Ship Missile Defense
M-X Strategic Missile
WAA - Wide Aperture Array Sonar .

o Programs Deferred or Maintained as Options in Advanced Development (FY 1978)

V/STOL (Type A)
AV-8B Harrier
TAW - Thrust Augmented Wing V/STOL
GSRS - General Support Rocket System
BVR - Beyond Visual Range Air-to-Air Missile
BRAZO - Air-to-Air Anti-Radiation Missile
TASES - EW Exploitation System
Electronically Agile Radar
SINCGARS - Field Army Radio
Integral Rocket Ramjet
Air Defense Gun System
MK-500 Evader Warhead
VCX/COD Aircraft
Propelled Ascent Mine
Surface Effects Ship
Advanced Satellite
SIRCS
Data Relay Satellite
Amphibious Assault Landing Craft
P-3X Advanced Vehicle for Ocean Control

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TABLE 5

Representative List of Joint Service Programs (FY 1978)
(Total Number Approximately 60)

NAVSTAR Global Positioning System	AF, N, A
AN/TTC-39 TRITAC Switch	A, N, AF, MC
AIM-9L, AIM-7F Air-to-Air Missiles	N, AF, MC
HARM	N, AF
Imaging Seeker	AF, N
REMBASS	A, AF, MC
Microwave Landing System	A, N, MC
Base Security	AF, A, MC
EO Guided Bomb	AF, N
GAMO Ground Amphibious Military Operations	A, N, AF, MC
JTIDS Secure Communications	AF, A, N
GATOR MINE	AF, A, N
F-16/F-18 Electronic Countermeasures	N, AF
BRAZO Anti-Radiation Air-to-Air Missile	AF, N
Beyond Visual Range Air-to-Air Missile	AF, N
Position Location Reporting System	A, MC
Tomahawk and ALCM Cruise Missiles	N, AF

Lead Service Underlined

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TABLE 6

RDT&E PROGRAM BY CATEGORY

($ Millions)

CATEGORY	FY 1976	FY 197T	FY 1977	FY 1978	FY 1979
Research	327.5	81.9	375.0	419.7	482.9
Exploratory Dev	1,180.8	302.2	1,305.8	1,460.1	1,590.5
Advanced Dev	1,795.3	507.4	1,904.2	2,296.7	3,431.5
Engineering Dev	3,620.1	874.6	4,216.7	4,872.5	5,007.7
Mgt & Support	1,253.9	332.9	1,381.0	1,410.1	1,506.8
Oper Sys Dev	1,342.5	317.6	1,412.9	1,584.5	1,953.9
TOTAL RDT&E	9,520.1	2,416.6	10,595.6	12,043.6	13,973.2

RDT&E PROGRAM BY BUDGET ACTIVITY

($ Millions)

BUDGET ACTIVITY	FY 1976	FY 197T	FY 1977	FY 1978	FY 1979
Technology Base	1,508.4	384.1	1,680.8	1,879.8	2,073.4
Advanced Tech Dev	565.5	148.0	636.0	688.4	1,039.5
Strategic Programs	2,235.1	553.5	2,235.3	2,439.5	2,890.5
Tactical Programs	2,974.6	756.7	3,650.3	4,408.1	4,827.6
Intel & Comms	948.9	235.7	982.3	1,169.8	1,563.8
Programwide Mgt and Support	1,287.6	338.6	1,410.9	1,458.0	1,578.4
TOTAL RDT&E	9,520.1	2,416.6	10,595.6	12,043.6	13,973.2

RDT&E BY TYPE OF PERFORMER

($ Millions)

PERFORMER	FY 1976	FY 197T	FY 1977	FY 1978	FY 1979
Industry	6,265.4	1,574.3	7,199.3	8,483.3	10,249.2
Government In-House	2,790.7	727.7	2,895.5	3,011.1	3,121.6
Federal Contract Research Centers (FCRC)	173.5	44.6	188.9	209.9	232.4
Universities	290.5	70.0	311.9	339.3	370.0
TOTAL RDT&E	9,520.1	2,416.6	10,595.6	12,043.6	13,973.2